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10/533,557	05/16/2006	Laurent Mazet	CR00566P	4562

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EXAMINER	
GANDHI, ANKIT P	
ART UNIT	PAPER NUMBER
2616	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/533,557	MAZET ET AL.	
	Examiner	Art Unit	
	ANKIT P. GANDHI	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7,8 and 10-12* is/are rejected.

7)☒ Claim(s) *6 and 9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 5 and 7 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claims 2-4 and 6. See MPEP § 608.01(n). Accordingly, the claims 5 and 7 not been further treated on the merits.

2. Claims 2-4, 6, and 8-10 are objected to because of the following informalities:

- Claim **2** comprising, "**a method according to….**" needs to be *corrected* with "**the method according to….**"
- Claim **3** comprising, "**a method of….**" needs to be *corrected* with "**the method of….**"
- Claim **4** comprising, "**a method of….**" needs to be *corrected* with "**the method of….**"
- Claim **6** comprising, "**a method of….**" needs to be *corrected* with "**the method of….**"
- Claim **8** comprising, "**a method of….**" needs to be *corrected* with "**the method of….**"
- Claim **10** comprising, "**a method of….**" needs to be *corrected* with "**the method of….**"

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Examiner respectfully request Applicant to determine each claimed element or numeric's disclosed in formula such as; element Q, H, E and P....

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-4, 8, 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm) in view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems), and view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems), and in further view of Ray et. al., Patent No.: US 6,173,011.

8. Claims 1-4, and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm) in view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems).

Regarding claims 1 and 11-12, AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems) discloses a system for channel estimation in an orthogonal frequency division multiplexed (OFDM) receiver, the system comprising:

demodulation means for applying Fourier transform to a received signal to obtain a frequency domain signal including a plurality of sub-carriers **(abstract, and page 488, 2 OFDM Systems with Channel Model, figure 1, and 1st paragraph .. wherein the cyclic prefix is removed at the receiver and the signal is demodulated with a discrete Fourier Transform...and the independent data symbols are modulated by *N* sub-carriers and inverse discrete FT....as disclosed in AAPA);**

decoding means for decoding the received signal **(page 487, 1st paragraph *introduction*, wherein OFDM, channel state information between transmit and receive antenna pairs is required for decoding, and a *channel estimator* further explained in column 1 and 2 (AAPA) of page 487; page 488 further comprising channel estimation algorithm, column 1, lines 1-12, wherein for clarification purpose, channel estimator algorithm comprising estimating probabilities of coded bits for plurality of frequency domain sub-carries).**

AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems) discloses all the limitation as disclosed above. However, AAPA fails to teach an

estimating probabilities of coded bits for at least said plurality of frequency domain sub-carriers; and channel estimation means for performing channel coefficient estimation for each of said plurality of frequency domain sub-carriers using channel coefficient estimates for at least one other of said plurality of frequency domain sub-carriers.

AAPA (Turbo Channel Estimation for OFDM systems on highly time and frequency selective channels) discloses an optimum turbo channel estimation algorithm for OFDM systems on highly selective fading channels... (Abstract), and as well further being illustrated in details; on page 2977, column 2, multiplicative two-dimensional fading channel characteristic, figure 1 comprising proposed receiver comprising DFT technique, and page 2978 comprising, sections 6 further disclose maximum a posteriori discrete channel estimation, EM algorithm, and page 2679, section 7 discloses conditional probabilities computation, and simulation result.

Therefore, it would have been obvious to combine teaching of AAPA in order for a receiver with spatial diversity using an optimum turbo estimation of the multi-path fading channels, which can increase degradation in performance with respect to the perfect channel estimation at low BER, and it can further improve time-frequency interleaving of coded data symbols and an enhanced initialization of the estimation algorithm; whereas further teaching of AAPA can be implemented in order to obtain good initial estimates, pilot symbols are used to estimate the initial value of the corresponding channel parameters according to a data-aided scheme, then the initial values of the complete channel parameters are determined using an interpolation technique in order to eliminate errors during transmission.

Regarding claims 2 and 3, AAPA discloses the same limitation as disclosed above in claim 1 and 12. Furthermore, AAPA teaches a method of channel estimation wherein said step of performing channel coefficient estimation for substantially each of said plurality of frequency domain sub-carriers uses channel coefficient estimation benefits from said channel coefficient estimates for substantially all the other frequency domain sub-carriers of said plurality (AAPA - Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems - page 488, sections 2, column 1-2, page 490, first paragraph... the number of prefix symbols, takes small values with respect to the total number of sub carriers carrying the data...., and page 491, sections 5, simulation results ...).

Regarding claim 4, AAPAs discloses the same limitation as disclosed above in claimed, therefore respectively rejected under the same basis.

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over 35 U.S.C. 103(a) as being unpatentable over AAPA (Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm) in view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems), and in further view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems)

Regarding claim 8, AAPAs discloses the same limitation as disclosed above. However, AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM

Systems), and AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems) fails to teach a method of channel estimation according to claim 5, wherein repeating said step of performing channel coefficient estimation comprises applying a cost function on an Expectation-Maximization algorithm on said plurality of frequency domain sub-carriers to improve said channel coefficient estimates.

AAPA (Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm) further comprises on page III-2337, Introduction section 1 comprising Expectation-Maximization (EM) algorithm….

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm) in view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems), and view of AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems), and in further view of Ray et. al., Patent No.: US 6,173,011.

Regarding claim 10, AAPA (Iterative channel estimation and decoding for a turbo-coded OFDM system via the EM algorithm), AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems), and AAPA (Maximum a Posteriori Multipath Fading Channel Estimation for OFDM Systems) disclose the same limitation as disclosed above. However, they fails to teach a method of channel estimation wherein said step of performing a channel coefficient estimation comprises applying a forward-backward algorithm on said

received signal to said plurality of channel coefficient estimates in which estimates are made in a first order of said plurality of frequency domain sub-carriers and subsequently estimates are made in a reversed order of said plurality of frequency domain sub-carriers so as substantially to equalise an estimation accuracy across said plurality of frequency domain sub-carriers.

Rey discloses forward-backward channel interpolator having a linear phase response has a first stage implemented with an IIR filter to achieve the narrow transition bandwidth with relatively few filter coefficients. Zero-stuffing and filtering are used to achieve the interpolation. A forward-backward filtering methodology is then used to achieve a linear phase response for the IIR filter. The input sequence to be interpolated is zero stuffed and passed through the IIR filter a first time. Then the time order of the resulting sequence is reversed and then passed through the IIR filter a second time. After that, the resulting output sequence is reversed again. Guard blocks are added to both ends of the input sequence, and then a block of zeros is appended to the zero-stuffed guarded input sequence. The appended zero block causes the startup and ending transient effect of the IIR filter's step response to be equal at both ends, which tends to improve the accuracy of the interpolation. Subsequent zero-stuffing and filtering by FIR filter stages are used to further increase the interpolation. A linear interpolator may also be included after the FIR filter stages (abstract, and figure 8, and further explained in claim 1, and also further explained in details, column 5-6, lines 33-40, and lines 1-25).

Allowable Subject Matter

11. Claims 6 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANKIT P. GANDHI whose telephone number is (571)270-3009. The examiner can normally be reached on Monday-Friday - 9:00 to 5:00 (Altern: Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on 571-272-3139. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. P. G./
Examiner, Art Unit 2616